SNOWMASS Cosmic Frontier Recap

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WFIRST SDT Meeting

March 18, 2013

SNOWMASS

- High Energy Physics community decadal planning process
- Culminates in “Snowmass on the Mississippi” in Minneapolis, 7/29 - 8/6 2013
- Product is a report and many sub-reports
- Process well under way
- Well-attended (~300) people meeting at SLAC March 6-8

SNOWMASS

http://www.snowmass2013.org/tiki-index.php

- **Energy Frontier**
  - Chip Brock (Michigan State), Michael Peskin (SLAC)
- **Intensity Frontier**
  - JoAnne Hewett (SLAC), Harry Weerts (Argonne)
- **Cosmic Frontier**
  - Jonathan Feng (UC Irvine), Steve Ritz (UC Santa Cruz)
- **Frontier Capabilities**
  - William Barletta (MIT), Murdock Gilchriese (LBNL)
- **Instrumentation Frontier**
  - Marcel Demarteau (ANL), Howard Nicholson (Mt. Holyoke), Ron Lipton (Fermilab)
- **Computing Frontier**
  - Lothar Bauerdick (Fermilab) and Steven Gottlieb (Indiana)
- **Education and Outreach**
  - Marge Bardeen (Fermilab), Dan Cronin-Hennessy (U of M)
- **Theory Panel**
  - Michael Dine (UC Santa Cruz)

Cosmic Frontier

- CF1: WIMP Dark Matter Direct Detection (Priscilla Cushman, Cristian Galbiati, Dan McKinsey, Hamish Robertson, Tim Tait)
- CF2: WIMP Dark Matter Indirect Detection (Jim Buckley, Doug Cowen, Stefano Profumo)
- CF3: Non-WIMP Dark Matter (Alex Kusenko, Leslie Rosenberg)
- CF4: Dark Matter Complementarity (Dan Hooper, Manoj Kaplinghat, Konstantin Matchev)
- CF5: Dark Energy and CMB (Sarah Church, Scott Dodelson, Klaus Honscheid)
- CF6: Cosmic Particles and Fundamental Physics (Jim Beatty, Ann Nelson, Angela Olinto, Gus Sinnis)

Dark Energy and CMB

- Cosmological Distances (Topical Conveners: Alex Kim, Nikhil Padmanabhan)
- Growth of Structure (Topical Conveners: Dragan Huterer; David Kirkby)
- Cross-Correlations (Topical Conveners: David Weinberg, Jason Rhodes)
- Novel Probes of Dark Energy (Topical Conveners: Bhuvnesh Jain and Chris Stubbs)
- Inflation (Topical Conveners: John Carlstrom and Adrian Lee)
- Neutrinos in the cosmos (Topical Conveners: John Carlstrom and Adrian Lee)

WFIRST

- This is a DOE-centric activity (but NSF is involved too)
- Focus in near term on MS-DESI
- Focus in longer term on LSST
- One recurring question is “what’s next for DE?”
- Stage V DETF?
- Stage IV.V (4.5)

Complementarity (Rhodes/Weinberg)

- Complementarity of probes
- Complementarity of missions/ surveys
- Complementarity of wavelengths

Probes

- Recent work from several groups work has indicated that we may not see the hoped for cosmological parameter gains from different probes in overlapping regions (e.g. WL and BAO/RSD in same area)
- However, the mitigation of systematics from such overlapping surveys may be more powerful (and important)

WFIRST is a Key Piece

- Neil gave a well-received WFIRST talk
- David S. will talk at Minneapolis meeting in August
- The exploration of DE rests on the combination of LSST, Euclid, and WFIRST
- Could pursue a DOE role in WFIRST?
- Stumbling block is that WFIRST is a broad mission and the SNOWMASS/HEP goals are more focused

General Thoughts on WFIRST

- The US dark energy community understands that this is a very powerful mission, even in light of Euclid. This is most clear for the SNe but I think the messages about systematic errors in wide angle surveys have gotten across (LSST is paying attention to the same issues).

- The sales pitch about the wide survey being the NIR complement to LSST is working.

- The enthusiasm is "latent" in the sense that **there is little confidence that the mission will go forward**. In part this is a result of history. In any case it will represent a problem for the next several years, as other groups plan their projects and time investments to the perceived landscape of the 2020s. The SDT has a role to play in building this confidence, but so does NASA.

How do we influence this? (CH)

- DoE is supporting scientists who are doing work for the SDT (full disclosure: at the moment this includes yours truly, but I'm thinking mainly of Saul's group). At a minimum, we'd like this to continue, especially over the next ~year as we nail down the mission design and go into the next level of detail (calibration plans, detector requirements etc). This can substantially reduce mission risk.

- Asking for a more major role for the DoE may be dangerous. We want to keep things moving. Adding the administrative structure of agency may not do this, particularly given the cultural differences.

- In optimizing the overall dark energy program, and particularly addressing cross-cutting issues like photo-z calibration, DoE and NSF folks on MS-DESI and LSST should be working with us on WFIRST. (We've started.) This requires the WFIRST mission architecture to be nailed down, something that we are well positioned to do in the report.

Community Input

- There is a chance for input
- On cross correlations, talk to Jason or David
- More generally about DE, talk to Scott Dodelson or approach the topical conveners on slide 5